

Role of Preferred Regional Modes in the Dynamics of the Global Climate System: Decadal to Century Time Scales

David Straus, Brian Doty
Center for Ocean-Land-Atmosphere Studies

We propose to apply modern statistical methods to rigorously identify the existence and behavior of significant atmospheric and oceanic modes, or regimes, in the Northern Hemisphere. Examples of such patterns identified in the past include the PNA, PDO and NA patterns, the ENSO-response pattern, the COWL pattern and the AO (annual mode).

The data sets to be utilized include the reanalyses of NCEP/NCAR and ECMWF (ERA-40), a number of multi-year integrations of various atmospheric GCMs utilizing specified sea-surface temperature (AMIP-like runs), and a number of historical and future climate change scenario simulations of the ECHAM, CCSM and PCM coupled ocean-atmosphere GCMs.

The methods to be used include the k-mean cluster analysis applied to a low-dimension sub-space of the high dimension atmospheric (or oceanic) low-frequency history, and the mixed model clustering approach in which a low-dimensional phase space is fit to a probability model consisting of a sum of a small number of multi-dimensional Gaussians. The latter approach allows for uncertainty in the cluster identification of any given geophysical state. In both methods, the significance of the relevant parameters will be tested, and the reproducibility of the results assessed.